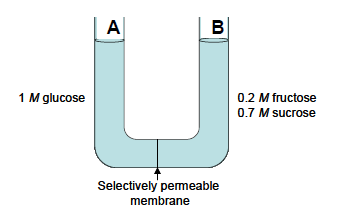
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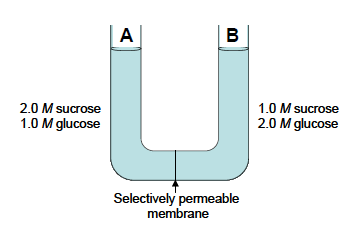
**Osmosis and Water Potential Practice Worksheet**

Ms. Ottolini, AP Biology



**Basic Osmosis Problems**

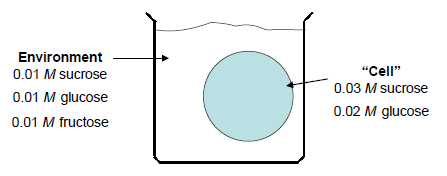
1. A solution of 1 M glucose is separated by a selectively permeable membrane from a solution of 0.2 M fructose and 0.7 M sucrose. The membrane is not permeable to the sugar molecules. Indicate which side is initially hypertonic and which is hypotonic. Show, using arrows, the direction of osmosis.

2. The solutions in the two arms of this U-tube are separated by a membrane that is permeable to water and glucose but not to sucrose. Side A is filled with a solution of 2.0 M sucrose and 1.0 M glucose. Side B is filled with a solution of 1.0 M sucrose and 2.0 M glucose.

a. Initially, the solution in side A is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_with respect to that in side B. (Options are hypotonic, hypertonic, and isotonic.)

b. After the system reaches equilibrium, describe what changes are observed.

3. An artificial cell consisting of an aqueous solution enclosed in a selectively permeable membrane has just been immersed in a beaker containing a different solution. The membrane is permeable to water and to the simple sugars glucose and fructose but completely impermeable to the disaccharide sucrose.



a. Which solute(s) will show a net diffusion into the cell?

b. Which solute(s) will show a net diffusion out of the cell?

c. The cell solution is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ with respect to the environment solution. (Options are hypotonic, hypertonic, and isotonic.)

d. In which direction will there be a net osmotic movement of water?

4. Red blood cells are placed in three beakers containing the following solutions: beaker A, distilled water; beaker B, isotonic solution; and beaker C, 5% salt solution. Describe the effect each solution will have on the cells and explain why.

a. Cells in beaker A:

b. Cells in beaker B:

c. Cells in beaker C:

**Water Potential Problems**

5. Determine the water potential of a cell if Ψp = 0.3 MPa and Ψs = -0.5 MPa. Show all work!

6. A plant cell with a solute potential of -0.65 MPa maintains a constant volume when bathed in a solution that has a solute potential of -0.30 MPa and is in an open container. What is the pressure potential of the cell? Show all work!

*Assumptions you can make:*

* *In an open container, the pressure potential of a solution is zero. Therefore, the water potential of the solution outside the cell is…*

*Ψs + Ψp = Ψ 🡪 (-0.30) + (0) = -0.30 MPa*

* *If the plant cell maintains a constant volume when placed in the outside solution, then it must be in equilibrium with the outside solution. In other words, they must have the same water potential so that water won’t have the tendency to move in or out of the plant cell.*

7. The value for Ψ in root tissue was found to be -3.3 bars. If you take the root tissue and place it in a 0.1 M solution of sucrose at 20°C in an open beaker, what is the Ψ of the solution, and in which direction would the net flow of water be?

8. NaCl dissociates into 2 particles in water: Na+ and Cl-. If the solution in question 4 contained 0.1M NaCl instead of 0.1M sucrose, what is the Ψ of the solution, and in which direction would the net flow of water be?